tinued. The instant the electro-magnet is made active by the transmission of the current through its helix, the copper tube acquires diamagnetic polarity by induction, and under the influence of this polarity the rotation is arrested, and the band of lights upon the screen is changed into a small stationary spot of illumination. When the electro-magnet is unmade by the arrest of the voltaic current, the spot of light again becomes an elliptical band, under the resumption of the twisting of the silk string with its mirrors and copper tube.

Of the numerous other very pleasing and telling illustrations exhibited in these lectures, space only permits allusion to be made to a very few which have been selected from the series, as being worthy of especial mention. The sound produced by the molecular vibration in iron when its mass is transiently magnetised by the voltaic current, is made audible by suspending an iron poker upon two sounding boards, and making it the core of a helix, conveying an electric current. An assistant is converted into an extemporised electrophorus, by flapping his black coat with fur while he stands upon a glass-legged stool. Small fish of gold leaf are made to float in the air current given off from the knob of a charged Leyden jar. A thick drinking glass is shattered by the expansion of the water contained in it, when sparks formed under the intensifying power of fifty condensers joined "in cascade," and primarily charged by a voltaic battery of one thousand cells, are passed through the liquid. To demonstrate the relation of resistance to heating power, a long line of wire is arranged in alternate links of platinum and silver, and when a voltaic current of due intensity is passed through the length, each stretch of the platinum wire is seen to glow with brilliant red heat, while the stretches of silver wire between remain still invisible. A beautiful series of Geissler's vacuum tubes were brought into successive operation, in which the auroral discharge was broken into stratified leaves, in which the glow was extinguished by the approximation of the poles of an electro-magnet, in which a feeble glow was converted into bright stratified light by the influence of a magnet; and beautiful beyond all the rest, the light from the enclosed negative terminal of the voltaic battery was arranged into the well-known lines of magnetic force, when subjected to the influence of the poles of a magnet.

It would be unnecessary in alluding to these very admirable lectures, to say one word of Prof. Tyndall's clearness and power as an expositor of the phenomena of Physical Science. These are now well known to the hundreds who are attracted to Albemarle Street on the frequently renewed occasions when the Professor performs this portion of his functions as a lecturer of the Royal Institution. It is, however, well worth while to draw attention to a device which the Professor adopts, with the happiest effect, to render his lectures as complete in their instruction as they can be made. He prints a series of well-digested "Notes" of the entire range of the subjects he passes over in each lecture, has them placed in the hands of each individual as he enters the lecture room, and then refers from time to time to the systematic outline, as occasion suggests the expediency of doing so. By this procedure the Professor is able to give full attention and time to each step of his illustrative demonstration, without being hampered with the need of telling everything that he has marked out beforehand—an extremely difficult thing to accomplish in a brief unextensible interval, where *viva voce* teaching has to be employed. Under this management any broken or omitted link in the full argument is readily recovered by glancing the eye over the range of printed notes after the conclusion of the lecture. This plan is well worthy of adoption, wherever popular lectures upon science are delivered to large audiences, with a view to instruction as well as amusement.

ZOOLOGY

Plateau on the Flight of Coleoptera

M. FELIX PLATEAU has supplemented the recent labours of Marey and others upon the flight of insects by examining the movements of the wings of certain Coleoptera. Specimens of the common May-beetle and *Oryctes nasicornis* were selected for experiment. The apparatus used consisted of two pulleys, fastened one above the other, at a distance of two centimetres, on a vertical support; the upper pulley made twelve turns for each one made by the lower, and could be caused to rotate twenty-four times in a second. The insects were killed by ether vapour immediately before each experiment; and the wings could be fastened, by a simple contrivance, to the front prolongation of the axis of the upper pulley.

A wing, in its folded state, was fixed on the instrument in such a manner that its plane made, with the plane of rotation, an angle of 45°, as in the living animal. On turning the pulleys, it struck the air obliquely by its upper surface and front margin; but the small diameter of the apparently continuous revolving disc (as indicated by a graduated scale) proved that the wing was still folded, and that centrifugal force had not affected it. When rotation was produced in an opposite direction, so that the wing struck the air both by its posterior membranous margin and inferior surface, the increasing diameter of the disc gave proof of the expansion of the wing, which, indeed, continued to be much extended when motion was arrested. When the plane of a wing was perpendicular to the plane of rotation, and the revolution of the wheel was such that the wing struck the air by its dorsal or upper surface, no extension ensued; when it struck by its lower surface, only partial extension followed. Now the oblique, not the perpendicular plane is that chosen by nature, and is, as has been seen, much more favourable for flight.

On fixing an open wing on the axis so as to make an angle with the plane of rotation, and turning in one direction, the wing remained open; on reversing the direction (*i.e.* acting on the upper surface) it became partially closed.

SCIENTIFIC SERIALS

IN the *Revue des Cours Scientifiques* for July 9, we have an important article on the Axioms of Geometry, by Prof. Helmholtz, which has, however, already appeared in an English form in the *Academy*, and the translation of an article by Mr. E. J. Reed, on *Navires blindés*; while M. Bernard concludes his course on Suffocation by the Fumes of Charcoal. In the number for July 16 there is an address by M. Dumas, delivered before the Academy of Sciences in honour of M. Pelouze, which occupies nearly the whole of the number, leaving room for only a short abstract of M. Bienaymés paper read before the Academy, on the military mortality in the Italian campaign of 1859-60.

Annales de Chimie et de Physique, May, 1870.—"Researches on the Gaseous Products of the Combustion of Coal," by M. A. Scheurer-Kestner. This important paper commences with an historical notice of experiments on this subject by Péclet, Ebelmen, Debette, Commines de Marsilly, Ebelmen and Sauvage, Foucou and Amiguis, and Cailleet, pointing out several causes of inaccuracy which are to be traced in their researches. The author then describes the process employed by him in collecting and analysing the gases from the flue of a steam boiler. Through the brickwork of the furnace a hole was bored, and in it was placed a platinum tube about 700 millimetres long and ten in diameter. To one end of this tube a copper pipe surrounded by a Liebig's condenser is soldered, the other end being closed with a plug. A narrow slit extends the whole length of the platinum tube, so that the air drawn through it is an average specimen of the gas in the flue. It is found also that the gas must be slowly aspirated through the slit in order to obtain a fair average of the gas passing through the flue during a considerable space of time. The author connected the apparatus with a water aspirator, by which he drew $\frac{1}{1000}$ of the total gas which passed up the chimney through the platinum tube; at the same time, from $\frac{1}{250}$ to $\frac{1}{500}$ of the aspirated gas was removed by a branch and collected in a bottle of three litres capacity, from which mercury was allowed to flow very slowly. Thus about $\frac{1}{500000}$ of the gas in the chimney was collected over mercury, and with this the analyses were performed. For the analytical processes we must refer the reader to the original paper, merely pointing out the conclusions at which the author has arrived. The gases of the chimneys were almost always found to contain carbonic oxide and hydrocarbons, even in the presence of oxygen arising from excess of atmospheric air. It was also found that the quantity of carbon lost in the form of smoke in the presence of sufficient air was about $\frac{1}{2}$ per cent., and that the loss of carbon as combustible gases does not exceed 2 or 3 per cent. when the excess of air amounts to 30 per cent. or more. The paper concludes with a section on the theory of the formation of smoke in the presence of an insufficient quantity of air, in which the author discusses the observations of Sainte-Claire Deville on dissociation, and of Berthelot on the action of heat on hydrocarbons, and points out their application to this subject.

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To the number for June, 1870, M. P. P. Dehérain contributes an extremely interesting paper "On the Evaporation of Water and the Decomposition of Carbonic Acid by the Leaves of Vegetables." After mentioning the works of previous investigators, he describes the process adopted and the results obtained in his experiments. The leaves were surrounded by a very light flask with a wide and short neck, or by an ordinary test tube in the case of long and narrow leaves, like those of graminiferous plants. The difference between the weight of the globe or tube before and after the experiment gave the quantity of water which was condensed from the leaves. The author finds that the evaporation takes place quite readily, even when the atmosphere surrounding the leaves is saturated with moisture. Different species of plants evolve very different quantities of water under similar conditions, and the proportion of water seems to increase as the size of the leaf diminishes. Thus large leaves of colza evolved between 1 and 2 per cent. of their weight of water in an hour; smaller leaves 11 or 12 per cent., leaves of wheat between 70 and 90 per cent., and of rye between 90 and 100 per cent. In direct sunlight the water evaporated very much exceeds that emitted in diffuse light and in perfect darkness. Thus barley evolved 74·2 per cent. in direct sunlight, 18·0 per cent. in diffuse light, and only 2·3 per cent. in the dark. Numerous experiments are cited to show that this is not caused by heat alone, for when the tube was surrounded with cold water, or even with melting ice, the quantity of water collected was increased, doubtless owing to the more complete condensation of the water. Another series of experiments was made to determine if light of different colours had any influence on the amount of water excreted; and it was observed that yellow light, which also produces more rapid decomposition of carbonic anhydride under the influence of green leaves, is the most favourable to the evolution of water. It has recently been asserted by M. Prillieux that the variations observed when experimenting on the decomposition of carbonic anhydride by green leaves under the influence of light are influenced more by the intensity of the light than by its colour. M. Dehérain has performed numerous experiments with liquids of different colours, but of the same transparency, and shows that the yellow light is the most energetic, then follow red, blue, and finally green.—"On the Determination of Graphite in Cast Iron and Steel." By M. Boussingault. The author treats the iron with corrosive sublimate mixed with water, and heats the residue to volatilise the mercurous chloride. The black substance which is left consists of graphite, amorphous carbon, and silica. This is then heated in the air, the amorphous carbon burns off, and the loss of weight indicates the quantity of carbon in combination with the iron; the residue is next heated in oxygen, so as to cause the combustion of the graphite, which is likewise determined by loss. When the metal is dissolved in hydrochloric acid, the combined carbon is evolved in combination with hydrogen, and part of the silicon present passes into solution.

SOCIETIES AND ACADEMIES

Geological Society, June 22.—Mr. Joseph Prestwich, F.R.S., president, in the chair. Mr. Horace Pearce, 21, Hagley Road, Stourbridge, and Mr. Samuel Spruce, of Tamworth, were elected Fellows of the Society.

1. "Notes on the Lower portion of the Green-slates and Porphyries of the Lake District between Ulleswater and Keswick." By Dr. H. Alleyne Nicholson, F.R.S.E., F.G.S., lecturer on Natural History in the Medical School of Edinburgh. The author describes the characters presented by the lower part of that series of rocks, named by Professor Sedgwick the "Green-slates and Porphyries," which overlie the Skiddaw Slates in the Lake District. He notices the sections of this series in Borrowdale, on the east side of Derwentwater, between Keswick and the Vale of St. John, in the Vale of St. John, in Matterdale, in Eycott Hill, between Ulleswater and Haweswater, and in the neighbourhood of Shap. In the Borrowdale section the sequence of the rocks is given by the author as follows:—Resting on the Skiddaw slates there are (1) a felspathic trap; (2) a great series of ashes, breccias, and amygdaloids, often showing slaty cleavage and worked as slates, but with several intercalated bands of trap; and (3) a second trap. This appears to be a normal section, and is repeated, but diversified by the results of folding and faults in the other localities described by the author, except that in the Vale of St. John the true slaty series seems to be entirely wanting.

2. "Observations on some Vegetable Fossils from Victoria." By Dr. Ferdinand von Müller and Mr. R. Brough Smyth, F.G.S. Mr. Smyth stated that the fossils, of which specimens were forwarded by him, were obtained in one of the deep leads at Haddon, near Smythesdale. No leaves have been obtained from the bed, which consists of a greyish-black clay; the fruits and seed-vessels were obtained about 180 feet from the surface, and represent a flora not very dissimilar to that now characterising some parts of Queensland. The specimens sent include the fruits of a supposed new genus of Coniferæ, described by Dr. von Müller under the name of *Spondylostrobus*. It is most nearly allied to *Solenostrobus*, Bowerbank, but its five valves are not keeled. The columella forms the main body of the fruit; and the seeds are apparently solitary. The species was named *Spondylostrobus smythii*. The remaining specimens consisted of a solitary fruit of a genus of Verbenaceæ; an indehiscent compressed fruit, probably belonging to the Proteaceous genus *Helicia*; a nut nearly allied to the preceding; a large, spherical, unilocular, 3-seeded nut with a thick pericarp, perhaps from a Capparideous plant; a 5-valved capsule of an unknown genus; and fruit-valves of three other plants, probably belonging to the Sapindaceæ, and perhaps allied to *Cupania*. One of the last may belong to the Meliciaceous genus *Dysoxylon*. Dr. Müller considered that these remains indicate a former flora analogous to that of the existing forests-belt of Eastern Australia.

3. "Note on some Plesiosaurian Remains obtained by Mr. J. C. Mansel, F.G.S., in Kimmeridge Bay, Dorset." By Mr. J. W. Hulke, F.R.S., F.G.S. The remains described in this note represent two new species of *Plesiosaurus*. The dorsal vertebræ of the first species are distinguished by extremely short centra, with hollow articular faces. The antero-posterior diameter of 4 centra ranges between 1 and 1·3 inch, the transverse horizontal diameter between 4 and 4·6, and the vertical between 3·8 and 4 inches. For this Plesiosaur the author proposes the specific name of *P. brachistospondylus*. The other species, of which the greater part of the spinal column and portions of the breast and pelvic girdles and limbs are preserved, is a long slender-necked Plesiosaur exceeding 16 feet in length. Its limbs are much larger in proportion to the whole length than in the typical Liassic forms of this genus; but what particularly distinguishes it from these are the massiveness of the humerus and femur, the longer size of the wing-like expansion of the postaxial border, a well-developed trochanter, and especially three articular facets at the distal end of the femur, corresponding to which the second segment of the paddle, representing the leg, contains three coequal bones. The author noticed the impression of a third bone in this segment in the matrix, in which a paddle of *Pliosarurus portlandicus* is imbedded, and the ossicle on the postaxial border of the fibula in *Plesiosaurus rugosus*. He compared the paddle-bones of the Kimmeridge *Plesiosaurus* with those of *Ichthyosauri* and of the Liassic Plesiosaurs and of *Pliosaurus*, he drew attention to the very close resemblance of the humerus and femur to type specimens of the femora of *Pliosaurus brachydeirus* and *P. trochanterius* in the British Museum, and traced a similar resemblance between the elements of the cnemion and tarsus, and those of the Dorchester and Portland Pliosaurian paddles. For this creature, combining a long truly Plesiosaurian neck with Pliosaurian-like limbs, the author proposed the name of *Plesiosaurus manselii*.

4. "Notes on the Geology of the Lofoten Islands." By the Rev. T. G. Bonney, M.A., F.G.S., Tutor of St. John's College, Cambridge. The author described the general appearance of the Lofoten islands, which have commonly been described as composed of granite, but which he stated really consist of gneissic rocks. The scenery of some of the islands, on which he did not land, resembled that of the Cambrian and Cambro-Silurian districts of Wales and Cumberland; and the interior of Hassel showed dark rounded fells, resembling in outline some of the softer Welsh slates. At Stokmarknæs and at Melbo there is a granitoid rock of pinkish-grey colour, consisting of felspar and platy hornblende, with some mica and quartz. The Svolvaer Fjeld in Ost Vaagö shows a distinctly bedded structure in the cliffs near Svolvaer, the *débris* at the foot of which consist of a rock resembling syenite, and a quartzite containing a little hornblende and felspar. Bedding was also observed towards the Oxnæs Fjord. The islets near this coast consisted chiefly of a granitoid rock resembling a syenite, showing traces of bedding to the west of Svolvaer. Seams and veins of quartz, hornblende,

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